

generally thought to be the shape of the Zodiacal Light), away from the Earth; and one is reminded of the anthelion on dew, but it is not likely we have in this case to deal with drops: but it is still possible that the zodiacal light is composed of particles which reflect light more readily straight towards the Sun than at other angles.

I subjoin the position of the brightest part of the light on every night on which I have seen it pretty definite. The longitude given is the distance f the Sun. In making nearly all these observations I was quite unaware of the actual position among the stars of the point opposite the Sun; so that my judgment of the position of maximum brightness was quite unbiassed.

Year.	Mo.	Day.	Long. f . Sun.	Lat.	Year.	Mo.	Day.	Long. f . Sun.	Lat.
1871	11	8	185	+3	1875	10	4	180	0
1872	10	9	about 182	0		10	5	179	0
1874	10	3	„ 186	+2		10	6	near 183	0
	11	6	„ 185	+3		10	8	„ 181	+1
1875	9	28	180	0		11	5	189-180	0
	10	2	179	0		11	7	186-178	+2

Sunderland, November 9, 1875.

Observations of the Zodiacal Light at Cadiz.

By Señor A. T. Arcimis.

(Abstract of a Paper published in the "*Bulletino Meteorologico del Collegio Romano.*")

FOR many years I have observed this phenomenon without the assistance of any instrument; but latterly, in February and subsequent months, I have made use of the spectroscope for the analyses of this luminous manifestation. The results of my investigations are contrary to the conclusions of Prof. Wright, of Yale College, and, notwithstanding my perfect confidence in what I have observed, I did not dare to publish a work that would be received probably with some diffidence without the powerful incitement of the illustrious Director of the Observatory of Rome.

In order that the reader may appreciate the accuracy of these observations, I think it right to give an account of the place where they were taken, and the instruments employed.

The city of Cadiz forms an almost regular polygon of five kilometers of perimeter, surrounded by the sea on all sides except on the east, where a narrow neck of land runs towards the mainland.

Nov. 1875.

Zodiacal Light at Cadiz.

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My Observatory is established at the top of the tower of my own house, situated to the N.N.W. of the city, at a height of 131 feet above the level of the sea, and in favourable weather I can see an horizon of twelve miles radius. There being no factories in this city, the smoke of the furnaces of which might obscure the air, the thermal equilibrium is re-established between land and sea shortly after sunset; the purity of the air and the small extension of the city admitting a rapid cooling.

The aspect presented to the naked eye on the horizon of Cadiz by the Zodiacal Light is a very interesting one. Its brilliancy is superior to the Milky Way in its most conspicuous part; its colour is not homogeneous in all the extension of the spindle, nor the same every evening. It is whitish from the apex to 30° or 40° , and from that height to the horizon it becomes yellowish or reddish. The resemblance of this tint with those of the eclipsed moon gave me the idea that this cupreous tint would be produced by our atmosphere. I observed attentively the setting of the Light, and the whitish or milky portion remained unchanged.

I have repeatedly made this observation in favourable evenings, always with the same result.

The altitude of the vertex has been determined by comparisons with some of the stars, the highest being 70° .

Sometimes I have seen to the east a kind of luminousness, not belonging to the twilight, because it lasted three or four hours after sunset. Its form is that of an iron lance, and it is of a whitish colour.

In some instances the Light presented, in all its extension, a vibratory movement; but I cannot say if this was in consequence of the weariness of my sight; as in other evenings the placidity of the splendour lent a more mysterious character to the phenomenon.

Having made the description of the Light as seen by the naked eye, I proceed to record its spectrum analysis; the observations have been conducted carefully, and without any preconceived idea, and I am perplexed in considering the discordance that exists between Prof. Wright's results and my own. He has worked with accurate instruments, but his conclusions are negative; and, although my means are modest, the observations were made repeatedly, and the results are positive. I should not doubt that his conclusions are right, but at the same time I am convinced of the correctness of my own.

With a pocket spectroscope, that I directed to the central and lowest portion of the cone, I immediately detected a continuous spectrum, I can say monochromatic, similar to those exhibited by the train of some falling stars. After a short time, and familiarised with the spectrum, I detected a faint yellowish or greenish line, which I first thought to be the sodium line, but I soon convinced myself that it was more refrangible. Widening the slit, the line appeared broader, whilst it lost much of its

D

brilliancy. The spectrum was also visible in other parts of the sky, especially in the splendour of the east, where the greenish line appeared more vaporous. I made use of a meteor spectro-scope, and detected the continuous spectrum accompanied by two luminous expansions, which were situated in the yellow and blue.

I then applied the refractor armed with a five-prisms spectro-scope by Hoffmann. The greenish line was situated between *D* and *E*, and the expansion seen in the blue showed a very faint line, more refrangible than *F*. The spectrum was not very bright, but was clearly defined.

The lines observed lost much of their brilliancy in the upper parts of the cone, and at 30° or 40° they became invisible, and the continuous spectrum only remained. These observations have been repeated on several occasions.

I resolved to ascertain the positions of these lines with the utmost accuracy that my limited means permit me, and disposed the induction coil and a set of Geissler's tubes.

The oxygen gas gives a spectrum of some lines, a yellow one being extremely conspicuous. Between this and the first of a green group, is situated the yellow line of the zodiacal light. If we adopt the Kirchhoff scale—and for the line *A* the number 405, for the *C* the 694, for the *D* the 1,004, and for the *E* the 1,523—I should suppose that the number corresponding to the yellow line is the 1,480, or a little less. This estimation, it is understood, is only an approximation.

The Hoffmann spectro-scope is a very good one for the more refrangible colours of the spectrum; the blue and violet are exceedingly pretty.

The position of the other line has been determined by means of a tube of coal gas. There is a group of four vaporous lines in its spectrum, and the blue line coincides with them; the number that I have assigned to it is the 2,270 of the same scale.

These observations we continued for several weeks, the Zodiacal Light being visible above the horizon of Cadiz until the middle of May, but the brilliant hues being no longer detected.

From these results, which (somewhat partially) I believe original, I think possible to infer the confirmation of the opinion of some astronomers, that the luminous atmosphere of the Sun is greater than that seen during the eclipses, its inferior part being the corona, and the limit reaching *Venus* and the Earth.

I would be very glad if some other observer, more competent than myself, would see if the lines that I have observed have any coincidence with any of the corona lines. It is possible that the line 1,480 might be the 1,474 of the *Aurora Borealis*.

Respecting the blue line, I am well convinced of its existence, but not so of its situation, nor whether it corresponds or not to the spectrum of carburetted hydrogen; but if this coincidence could be proved, remembering that the materials of comets must direct themselves to the Sun, as the great centre of attraction,

we cannot be surprised at the intimate connection which the spectroscope reveals to us between the physical nature of this star and the carbonous bodies that go to feed it.

It would lead me too far from my purpose to enter into a discussion of the before-mentioned phenomenon; others, with more right, can treat this matter with a knowledge that I do not possess.

Observations of Coggia's Comet = Comet III, 1874, made at Dunsink Observatory, Dublin.

1874	Dublin M.T.			R.A.			Decl.			Remarks	Observer
	h	m	s	h	m	s	°	'	"		
June 11	13	41	20.0	7	2	16.63	+69	1	3.4	Very unsteady.	Brünnow.
„ 12	13	39	10.8	7	4	3.62	68	59	55.3		„
„ 13	13	34	54.9	7	7	40.17	68	56	11.8		„
„ 14	13	32	47.8	7	9	29.30	68	53	25.0		„
„ 15	13	28	35.4	7	13	9.33	68	45	41.6	Exceedingly bad } atmosphere. }	„
„ 16	13	24	22.8	7	16	49.16	68	34	16.2		„
„ 17	13	11	21.8	7	27	25.35	+67	26	8.5		Ball.

Dunsink, November 19, 1875.

Discovery and Observations of Eight Minor Planets (149) to (156).

Planet (149) was discovered by M. Perrotin, at the observatory of Toulouse, on September 21, the R.A. and N.P.D. at 8^h mean time of Toulouse, being respectively 23^h 16^m 8^s and 95° 12'. Magnitude 13.

Planet (150) was discovered by Mr. Watson, at Ann Arbor. A telegram announcing its discovery was received in Europe on October 19. Magnitude 10.11. The following early observations have been made in Europe:

1875.	h m s			Observed R.A.	l.f.p.	Observed N.P.D.	l.f.p.
				h m s		° ' "	
Oct. 21	9	10	57	M.T. Düsseldorf	0 59 2.92	...	83 14 51.2 ...
25	9	8	22	„ „	0 56 18.09	...	83 35 40.4 ...
26	10	46	2	„ Pola	0 55 37.60	7.311	83 41 3.8 9.792
27	13	32	10	„ Leipzig	0 54 54.53	9.422	83 46 37.3 0.807
Nov. 1	12	52	30	„ Berlin	0 52 0.73	9.378	84 9 38.0 0.818
2	9	18	25	„ „	0 51 33.87	8.863	84 13 16.4 0.810